

METHOD OF TRANSMITTING MESSAGES BETWEEN BUS USERS

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is a continuation of PCT Application No. PCT/EP02/10501 filed on September 19, 2002.

BACKGROUND AND SUMMARY OF THE INVENTION

[0002] The invention relates to a method of transmitting messages between bus users which are each connected with a communication bus for exchanging messages, and having a diagnostic device for a disturbance of the communication bus.

[0003] The necessity of mutually connecting several bus users, such as control units and sensors, increasingly exists in modern vehicles. Such control units are, for example, an electronic engine control and the control of an automatic transmission. In order to read out faults for such a control unit during a repair shop stay, it is known from German Published Patent Application DE 39 34 974 A1 to arrange a diagnostic bus as a diagnostic device in the vehicle. One bus line is used for the transmission of control signals and the other line is provided as a status line. This results in considerable constructive expenditures just for the diagnosis.

[0004] From German Patent Document DE 19837242 C, a method of the above-mentioned type is known, in the case of which a data transmission also takes place by way of a separate diagnostic bus in the event of a fault. The

diagnostic bus represents a redundant data bus. As in German Patent Document DE 39 34 974 A1, considerable constructive expenditures are also required here. Furthermore, a possibly occurring fault, as a rule, cannot be seen in the data transmission because the diagnostic bus will then automatically "intervene". If, as in the case of German Patent Document DE 39 34 974 A1, the status of the transmitted message is checked, the status does not change in the event of a fault.

[0005] It is an object of the invention to provide a method of transmitting messages between bus users of a vehicle, which permits a reliable diagnosis of a disturbance in the data transmission, specifically in the case of a data transmission between two bus users, without any special expenditures.

[0006] This object is achieved by a method of transmitting messages between bus users which are each connected with a communication bus for exchanging messages, and having a diagnostic device for a disturbance of the communication bus, wherein in a diagnostic operating mode differing from the normal operation, for the diagnosis of a message transmission between two bus users, the bus user receiving the message is asked by the diagnostic device to output the message on the communication bus. Advantageous further developments of the invention are described and claimed herein.

[0007] In an operating mode which differs from the normal operation, using the diagnostic device, the bus user normally receiving the message can be caused, in a targeted manner, to output the message to the communication bus. If the bus user does not do so, or if the message is damaged, a disturbance is

present. However, it can then not yet be determined where the disturbance is situated.

[0008] For localizing the source of the disturbance, a third bus user not participating in this message transmission in the normal operation, can be caused in the diagnostic operation to receive this message. The status of this message for the three bus users is subsequently read out. If the fault is present in the sender, the two receiving bus users have the same status ("no message present"). If the fault is in the receiver, the two receivers have different statuses.

[0009] The method according to the invention is particularly suitable for a bilateral message transmission. For messages which are transmitted in the normal operation between more than two bus users, in the operating mode differing from the normal operation, the addition of another bus user is no longer required. Here, it is sufficient for the status of this message to be read out for all bus users participating in this message transmission. A fault of the sender does not change the message status of the receivers. A fault in a receiver can be recognized by the different status of this receiver in comparison to the other receivers.

[0010] Other objects, advantages and novel features of the present invention will become apparent from the following detailed description of the invention when considered in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWING

[0011] The figure shows the typical architecture of a data bus system in the vehicle.

DETAILED DESCRIPTION OF THE DRAWINGS

[0012] Referring to the figure, by means of the data bus, the condition of a switch 1, which is connected to a control unit 2, is to be reported to another control unit 4. The control units 2 and 3, as well as another control unit 4, are connected to a communication bus 6, and likewise a gateway 5. By way of the gateway 5, each control unit 2, 3, 4 can be addressed by way of a diagnostic tester 8.

[0013] The switch 1 is read in by the control unit 2 and the switch condition information is transmitted to the control unit 3 by way of the bus system. The tester 8 can query the condition of the switch from the control unit 2. In addition, the status of the message transmitted by way of the bus 6 can be queried from the control unit 3.

[0014] In the event of a fault, the status of the switch 1 is correctly detected in control unit 2 but not in control unit 3. It can therefore not be determined whether the message concerning the condition of the switch 1 is not placed on the bus by control unit 2 or whether control unit 3 does not receive the message correctly.

[0015] According to the invention, a diagnostic device (tester 8) is connected by way of the gateway 5 and a diagnostic operation is set. In this case, control unit 3 is queried in a targeted manner about the message of control unit 2. If control unit 3 has received this message and is working without any disturbance, it places the message on the communication bus. The tester receives the message and determines that the overall system is working properly.

[0016] Correspondingly, in the case of several messages, which also originate from several senders (control units and the like), the receiver or receivers can be caused to output the respective message which is of interest. The overall system can thereby be tested in a targeted manner.

[0017] If a fault occurs which, in the above-mentioned example, can be detected by means of the absent, or only partially present, message of control unit 2, control unit 4 is caused to also receive the switch condition information. By way of the gateway, the message statuses of control units 2 to 4 are queried. If the statuses of control units 3 and 4 are the same, the fault is present in control unit 2; if they differ (that is, control unit 4 has received the message and not control unit 3), the fault is present in control unit 3.

[0018] In order to generate no additional expenditures for the diagnostic function in the case of messages sent from one control unit to several control units, ideally the control units which receive the message anyhow, which is to be examined, are utilized for this diagnostic function.

[0019] In that case, the tester 8 has to contain a table which shows which signals are received by which control units. If all control units which actually are to be addressed receive no message, the fault is with the sender; otherwise, it is with that receiver which, in contrast to the other receivers, receives no message.

[0020] It thereby becomes possible to continuously follow signals in bus systems by means of existing shop devices and without any high expenditures and to precisely define the site of the fault.

[0021] The foregoing disclosure has been set forth merely to illustrate the invention and is not intended to be limiting. Since modifications of the disclosed embodiments incorporating the spirit and substance of the invention may occur to persons skilled in the art, the invention should be construed to include everything within the scope of the appended claims and equivalents thereof.